CLAIMS:

Claim 1. A probe for computing a relative surface energy of a test surface, comprising:

a manipulator movable parallel to the test surface;

a mandrel attached to the manipulator through a rotary joint;

a sampler with a first surface engaged with the mandrel, the sampler having a convex tacky surface, a portion of the convex tacky surface contacting the test surface, wherein motion of the manipulator parallel to the test surface rotates the sampler engaged with the mandrel;

a force sensor affixed to the manipulator for generating a force signal proportional to force applied by the manipulator to the mandrel in the direction of motion of the manipulator;

a rotation sensor for generating a rotary motion signal in response to rotation of the mandrel; and

a controller for receiving the force signal and the rotary motion signal; whereby the controller computes the relative surface energy of the test surface utilizing the force signal and the rotary motion signal.

Claim 2. The apparatus of claim 1, wherein the manipulator is a handle, whereby an operator manually moves the handle parallel to the test surface.

Claim 3. The apparatus of claim 1, wherein the sampler is flexible, the mandrel further comprising:

a sampler engagement surface for engaging the first surface of the sampler; and

a compliant layer adjoining the sampler engagement surface, whereby the compliant layer and the sampler engagement surface urge the sampler into intimate contact with the test surface.

Claim 4. The apparatus of claim 3, wherein the compliant layer has a durometer of less than 40 on the Shore A scale.

Claim 5. The apparatus of claim 1, wherein the sampler further comprises a compliant layer with a durometer of less than 40 on the Shore A scale.

Claim 6. The apparatus of claim 1, wherein the sampler removably engages the mandrel, the mandrel further comprising an adjustment means that selects the degree of engagement between the mandrel and the sampler.

Claim 7. The apparatus of claim 6, wherein the adjustment means is a knob that varies the radial extent of the mandrel.

Claim 8. The apparatus of claim 6, further comprising a receiver carrier for fixing a sampler in a field of view of a surface analysis tool remote from the test surface, whereby the sampler may be removed from the mandrel and the test surface, and the sampler may be fixed by the receiver carrier and examined by the surface analysis tool.

Claim 9. The apparatus of claim 1, the mandrel further comprising a coupler with a mating relationship to a coupler receiver on surface analysis tool remote from the test surface, whereby the mandrel with the engaged sampler may be coupled to the surface analysis tool.

Claim 10. The apparatus of claim 1, the convex tacky surface further comprising a surface patch with low-tack.

Claim 11. The apparatus of claim 1, wherein the rotation sensor is selected from one of the following sensors: a Hall detector embedded in the manipulator, an optical detector in the manipulator, a tachometer actuated by rotation of the mandrel with respect to the manipulator, and segmented sliding rotary electrical contacts associated with the rotary joint.

Claim 12. The apparatus of claim 1, wherein the force sensor is a strain gage affixed to the manipulator and responsive to mechanical strain in the manipulator.

Claim 13. The apparatus of claim 1, wherein the controller is a microprocessor located in the manipulator.

Claim 14. The apparatus of claim 13, further comprising a display means responsive to the microprocessor.

Claim 15. The apparatus of claim 1, further comprising:

a first memory for storing the force signal; and

a second memory for storing the rotation signal.

Claim 16. The apparatus of claim 15, wherein the controller is a computer external to the manipulator, further comprising a communication means for transmitting the contents of the first and second memory means to the computer, whereby the computer computes the relative surface energy of the test surface using the transmitted contents of the first and second memory means.

Claim 17. The apparatus of claim 1, the controller further comprising a stored nominal relative surface energy, whereby the controller computes a control indication based on the variation between the stored nominal relative surface energy and the computed relative surface energy.

Claim 18. The apparatus of claim 17, further comprising:

a stored threshold value; and

a molecular contamination indication generated by the controller when the control indication exceeds the threshold value.

Claim 19. A method for measuring the relative surface energy of a test surface, the method comprising the steps of:

a) engaging a sampler on a mandrel rotatably joined to a manipulator;

b) contacting a portion of a convex tacky surface of the sampler to the test surface;

c) moving the manipulator parallel to the test surface and rotating the mandrel engaged with the sampler in contact with the test surface;

d) generating a force signal F_s proportional to the force applied by the manipulator to the mandrel;

e) generating a rotation rate signal R_s proportional to the rate of rotation of the mandrel; and

f) combining the force signal signal F_s and the rotation rate signal R_s to produce a relative surface energy measurement S_e of the test surface.

Claim 20. The method as recited in claim 19, wherein said moving step for executing manually by an operator.

Claim 21. The method as recited in claim 19, wherein said contacting step further comprising complying the portion of the convex tacky surface of the sampler to the test surface.

Claim 22. The method as recited in claim 19, further comprising the step of removing the sampler from the test surface.

Claim 23. The method as recited in claim 22, further comprising the step of inspecting the sampler after said removing step.

Claim 24. The method as recited in claim 22, wherein the step of removing the tacky roll from the test surface further comprising the step of rolling the sampler to a portion of low tack.

Claim 25. The method as recited in claim 22, further comprising the step of constricting the mandrel and releasing the sampler from the mandrel.

Claim 26. The method as recited in claim 22, further comprising the step of transporting the sampler to an analysis tool.

Claim 27. The method as recited in claim 19, wherein the step of combining a force signal F_s and a rotation signal R_s to produce the relative surface energy measurement S_e approximately proportional to F_s / R_s.

Claim 28. The method as recited in claim 19, further comprising the step of storing the force signal and the rotation signal in memory locations in the manipulator.

Claim 29. The method as recited in claim 19, further comprising the step of displaying the relative surface energy measurement using a display means in the manipulator.

Claim 30. The method as recited in claim 19, further comprising the step of transmitting the force signal and the rotation signal to an external computer.

Claim 31. The method as recited in claim 19, further comprising the step of comparing the relative surface energy measurement with a previously measured value.

Claim 32. The method as recited in claim 31, further comprising the step of indicating a degree of molecular contamination on the test surface.